

Appl. No. 10/677,966  
Docket No. 14XZ126398/GEM-0171

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FEB 20 2007

### AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

#### Listing of Claims:

1. (currently amended) A method for [[the]] a space-time filtering of noise in radiography comprising:

a. for each pixel having coordinates (x,y) of a first image, a weighting is performed on [[the]] coefficients  $U(k,l)$  of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of [[the]] a difference computed between  $I(x,y)$  and  $I(x+k, y+l)$ , where  $I(x,y)$  is [[the]] an intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the first convolution core, a second convolution core with coefficients  $Up(k,l)$  being thus obtained;

b. for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients  $U(k,l)$  of the first convolution core as a function of the coefficient G which is a function of the difference computed between  $I(x,y)$  and  $I'(x+k, y+l)$ , where  $I'(x,y)$  is [[the]] an intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients  $Up'(k,l)$  being thus obtained; and

c. [[the]] a filtered value of  $I(x,y)$  is computed by the formula:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l) * I(x+k, y+l) + (1-\gamma) * Up'(k, l) * I'(x+k, y+l)) \right) / N \dots (1)$$

$$L = (D-1)/2 \dots (2)$$

$$\gamma \in [0,1] \dots (3)$$

$$N = \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l) + (1-\gamma) * Up'(k, l)) \dots (4)$$

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where  $F(x,y)$  is the filtered value of  $I(x,y)$ ; and  
wherein  $D$  is greater than 1.

2. (currently amended) The method according to claim 1 wherein:

$$U_p(k,l) = U(k,l) \times G(I(x+k,y+1) - I(x,y); \sigma(I(x,y))); \text{ and}$$

$$[[U_p(k,l)]] \underline{U_p'(k,l)} = U(k,l) \times G(I'(x+k,y+1) - I(x,y); \lambda \sigma(I(x,y)))$$

with  $G$  as a weighting function depending on a difference between the value of the pixel to be filtered and its neighborhood and depending on a noise statistic for the value of the pixel to be filtered.

3. (currently amended) The method according to claim 2 wherein  $G$  is a function of  $[[\text{the}]]$  a difference  $\epsilon$  computed and of a known noise statistic  $\sigma$  for  $I(x,y)$ , the coefficient  $G$  being then written as  $[[\text{the}]]$  a function  $G(\epsilon, \sigma)$ , where  $G$  is therefore  $[[\text{the}]]$  a value in terms of  $\epsilon$  of a Gaussian curve centered on 0 and having a standard deviation  $\sigma$ .

4. (original) The method according to claim 2 wherein  $G$  is a function of the computed difference  $\epsilon$  of the following type:

$$G(\epsilon) = -a \cdot \epsilon + 1, \text{ with } a > 0, \text{ et}$$

$$U_p(k,l) = U(k,l) \times G(I(x+k,y+1) - I(x,y)), \text{ and}$$

$$U_p'(k,l) = U(k,l) \times G(I'(x+k,y+1) - I(x,y)).$$

5. (original) The method according to claim 2 wherein  $\lambda$  is a real number.
6. (original) The method according to claim 3 wherein  $\lambda$  is a real number.
7. (original) The method according to claim 4 wherein  $\lambda$  is a real number.

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8. (original) The method according to claim 1 wherein equation (1) becomes:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l).I(x+k, y+l) + (1-\gamma) * Up'(k, l).F'(x+k, y+l)) \right) / N$$

where  $F'(x, y)$  is the filtered intensity of the pixel with coordinates  $(x, y)$  of the second image.

9. (original) The method according to claim 2 wherein equation (1) becomes:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l).I(x+k, y+l) + (1-\gamma) * Up'(k, l).F'(x+k, y+l)) \right) / N$$

where  $F'(x, y)$  is the filtered intensity of the pixel with coordinates  $(x, y)$  of the second image.

10. (original) The method according to claim 3 wherein equation (1) becomes:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l).I(x+k, y+l) + (1-\gamma) * Up'(k, l).F'(x+k, y+l)) \right) / N$$

where  $F'(x, y)$  is the filtered intensity of the pixel with coordinates  $(x, y)$  of the second image.

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11. (original) The method according to claim 4 wherein equation (1) becomes:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * U_P(k, l) \cdot I(x+k, y+l) + (1-\gamma) * U_P'(k, l) \cdot F'(x+k, y+l)) \right) / N$$

where  $F'(x, y)$  is the filtered intensity of the pixel with coordinates  $(x, y)$  of the second image.

12. (original) The method according to claim 5 wherein equation (1) becomes:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * U_P(k, l) \cdot I(x+k, y+l) + (1-\gamma) * U_P'(k, l) \cdot F'(x+k, y+l)) \right) / N$$

where  $F'(x, y)$  is the filtered intensity of the pixel with coordinates  $(x, y)$  of the second image.

13. (original) The method according to claim 1 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

14. (original) The method according to claim 2 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

15. (original) The method according to claim 3 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

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16. (original) The method according to claim 4 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

17. (original) The method according to claim 5 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

18. (original) The method according to claim 8 wherein a value of  $\gamma$  equal to 0 implies a zero temporal dependence.

19. (currently amended) The method according to claim 1 wherein the first and second images are successive images of a sequence of images, the first image having a date time  $t$ , and the second image having a date time  $t-1$ .

20. (currently amended) The method according to claim 2 wherein the first and second images are successive images of a sequence of images, the first image having a date time  $t$ , and the second image having a date time  $t-1$ .

21. (currently amended) The method according to claim 3 wherein the first and second images are successive images of a sequence of images, the first image having a date time  $t$ , and the second image having a date time  $t-1$ .

22. (currently amended) The method according to claim 4 wherein the first and second images are successive images of a sequence of images, the first image having a date time  $t$ , and the second image having a date time  $t-1$ .

23. (currently amended) The method according to claim 5 wherein the first and second images are successive images of a sequence of images, the first image having a date time  $t$ , and the second image having a date time  $t-1$ .

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24. (currently amended) The method according to claim 8 wherein the first and second images are successive images of a sequence of images, the first image having a date time t, and the second image having a date time t-1.

25. (currently amended) The method according to claim 13 wherein the first and second images are successive images of a sequence of images, the first image having a date time t, and the second image having a date time t-1.

26. (original) The method according to claim 1 wherein D is equal to 5.

27. (original) The method according to claim 2 wherein D is equal to 5.

28. (original) The method according to claim 3 wherein D is equal to 5.

29. (original) The method according to claim 4 wherein D is equal to 5.

30. (original) The method according to claim 5 wherein D is equal to 5.

31. (original) The method according to claim 8 wherein D is equal to 5.

32. (original) The method according to claim 13 wherein D is equal to 5.

33. (original) The method according to claim 19 wherein D is equal to 5.

34. (original) The method according to claim 1 wherein D is greater than 5.

35. (original) The method according to claim 2 wherein D is greater than 5.

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36. (original) The method according to claim 3 wherein D is greater than 5.
37. (original) The method according to claim 4 wherein D is greater than 5.
38. (original) The method according to claim 5 wherein D is greater than 5.
39. (currently amended) The method according to claim ~~[[5]]~~ 8 wherein D is greater than 5.
40. (currently amended) The method according to claim ~~[[8]]~~ 13 wherein D is greater than 5.
41. (original) The method according to claim 19 wherein D is greater than 5.
42. (cancelled)
43. (original) The method according to claim 1 wherein D is an odd number.
44. (original) The method according to claim 2 wherein D is an odd number.
45. (original) The method according to claim 3 wherein D is an odd number.
46. (original) The method according to claim 4 wherein D is an odd number.
47. (original) The method according to claim 5 wherein D is an odd number.
48. (original) The method according to claim 8 wherein D is an odd number.
49. (original) The method according to claim 13 wherein D is an odd number.

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- 50. (original) The method according to claim 19 wherein D is an odd number.
- 51. (original) The method according to claim 26 wherein D is an odd number.
- 52. (original) The method according to claim 34 wherein D is an odd number.
- 53. (original) A space-time convolution filter designed according to the method of claim 1.
- 54. (original) A scanner for radiography having a filter according to claim 53.
- 55. (cancelled)



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56. (currently amended) A computer program product comprising a computer useable readable medium having computer readable program code means embedded stored in the medium, the computer program product comprising:

a. computer readable program code means embedded stored in the medium for causing a computer to provide for each pixel having coordinates (x,y) of a first image, a weighting is performed on [[the]] coefficients U(k,l) of a first convolution core with a dimension D, equivalent to a low-pass filter, as a function of a coefficient G which is a function of [[the]] a difference computed between I(x,y) and I(x+k, y+l), where I(x,y) is [[the]] an intensity of the pixel with coordinates (x,y) of the first image, and k and l are indices used to explore the coefficients of the first convolution core, a second convolution core with coefficients Up(k,l) being thus obtained;

b. computer readable program code means embedded stored in the medium for causing a computer to provide for each pixel with coordinates (x,y) of the first image, a weighting is performed on the coefficients U(k,l) of the first convolution core as a function of the coefficient G which is a function of the difference computed between I(x,y) and I'(x+k, y+l), where I'(x,y) is [[the]] an intensity of the pixel with coordinates (x,y) of a second image, a third convolution core with coefficients Up'(k,l) being thus obtained; and

c. computer readable program code means embedded stored in the medium for causing a computer to provide [[the]] a filtered value of I(x,y) is computed by the formula:

$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l) \cdot I(x+k, y+l) + (1-\gamma) * Up'(k, l) \cdot I'(x+k, y+l)) \right) / N \dots (1)$$

$$L = (D-1)/2 \dots (2)$$

$$\gamma \in [0,1] \dots (3)$$

$$N = \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * Up(k, l) + (1-\gamma) * Up'(k, l)) \dots (4)$$

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where  $F(x,y)$  is the filtered value of  $I(x,y)$ ; and  
wherein  $D$  is greater than 1.

57. (currently amended) An article of manufacture for use with a computer system, the article of manufacture comprising a computer readable medium having computer readable program code means embedded stored in the medium, the program code means comprising:

a. computer readable program code means embedded stored in the medium for causing a computer to provide for each pixel having coordinates  $(x,y)$  of a first image, a weighting is performed on the coefficients  $U(k,l)$  of a first convolution core with a dimension  $D$ , equivalent to a low-pass filter, as a function of a coefficient  $G$  which is a function of the a difference computed between  $I(x,y)$  and  $I(x+k, y+l)$ , where  $I(x,y)$  is the an intensity of the pixel with coordinates  $(x,y)$  of the first image, and  $k$  and  $l$  are indices used to explore the coefficients of the first convolution core, a second convolution core with coefficients  $U_p(k,l)$  being thus obtained;

b. computer readable program code means embedded stored in the medium for causing a computer to provide for each pixel with coordinates  $(x,y)$  of the first image, a weighting is performed on the coefficients  $U(k,l)$  of the first convolution core as a function of the coefficient  $G$  which is a function of the difference computed between  $I(x,y)$  and  $I'(x+k, y+l)$ , where  $I'(x,y)$  is the an intensity of the pixel with coordinates  $(x,y)$  of a second image, a third convolution core with coefficients  $U_p'(k,l)$  being thus obtained; and

c. computer readable program code means embedded stored in the medium for causing a computer to provide the a filtered value of  $I(x,y)$  is computed by the formula:

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$$F(x, y) = \left( \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * U_p(k, l) \cdot I(x+k, y+l) + (1-\gamma) * U_{p'}(k, l) \cdot I'(x+k, y+l)) \right) / N \dots (1)$$

$$L = (D-1)/2 \dots (2)$$

$$\gamma \in [0, 1] \dots (3)$$

$$N = \sum_{k=-L}^L \sum_{l=-L}^L (\gamma * U_p(k, l) + (1-\gamma) * U_{p'}(k, l)) \dots (4)$$

where  $F(x, y)$  is the filtered value of  $I(x, y)$ ; and  
wherein  $D$  is greater than 1.

58. (new) The method according to claim 1 wherein a value of  $\gamma$  is greater than 0 and less than 1.

59. (new) The computer program product according to claim 56 wherein a value of  $\gamma$  is greater than 0 and less than 1.

60. (new) The article of manufacture according to claim 57 wherein a value of  $\gamma$  is greater than 0 and less than 1.

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